

Serial No. 10/066,764

Docket No. K-0392

Reply dated **February 11, 2004**

In Response to Office Action dated October 17, 2003

**Amendments to the Specification**

*Please replace paragraph [017] which bridges pages 5 and 6 with the following amended paragraph:*

Referring to FIGS. 3-4, there are an input optical fiber bundle placed on a first substrate of silicon or glass, and an output optical fiber bundle placed on the first substrate at a location spaced a distance from the input optical fiber bundle. Each of the input/output optical fiber bundles is a two dimensional array of a plurality of optical fibers fitted on a ~~second substrate~~ fiber support substrate of silicon. There are an input micro-mirror, and an output micro-mirror placed between the input optical fiber bundle and the output optical fiber bundle to face each other at a distance, and at a 45° to a direction of light from respective optical fiber bundles. Each of the input/output micro-mirrors is a two dimensional array of a plurality of micro-mirrors each having two rotational axes fitted to a ~~third~~ micro-mirror support substrate.

*Please replace paragraph [018] on page 6 with the following amended paragraph:*

It is required that the input/output micro-mirrors, and the input/output optical fiber bundles are fixed to the first substrate, accurately. Therefore, the present invention suggests to insert, and fix the ~~third~~ micro-mirror support substrate of the input/output micro-mirrors, and the ~~second~~ fiber support substrate of the input/output optical fiber bundles in respective grooves formed in the first substrate, to facilitate an optical alignment between the input/output micro-mirrors and the input/output optical fiber bundles, not by an active method, but by a self-alignment method.

Reply dated February 11, 2004

In Response to Office Action dated October 17, 2003

*Please replace paragraph [019] on page 6 with the following amended paragraph:*

The optical alignment will be explained in more detail. FIGS. 5A-5C illustrate sections showing the steps of a method for forming a groove in the first substrate in FIG. 3, and FIG. 6 illustrates a section of third micro-mirror support substrates of micro-mirrors inserted in grooves in a first substrate.

*Please replace paragraph [021] which bridges pages 6 and 7 with the following amended paragraph:*

Then, referring to FIG. 5B, the first substrate with a sloped groove is subjected to dry etching by using deep RIE, to form a vertical groove in the sloped groove, to form a Y formed groove having sloped upper part sides, and vertical lower part sides as shown in FIG. 5C. Because the third micro-mirror support substrates of the input/output micro-mirrors and the second fiber support substrates of the input/output optical fiber bundles are required to be inserted in the first substrate in vertical, it is required that a perpendicularity of the dry etching process is controlled accurately.

*Please replace paragraph [022] on page 7 with the following amended paragraph:*

Referring to FIG. 6, the third micro-mirror support substrates of the input/output micro-mirrors, and the second fiber support substrates (not shown) of the input/output optical fiber bundles are respectively inserted in the grooves in the first substrate, vertically. In this instance, the sloped part at the entrance of the groove facilitates an easy initial insertion of the third micro-mirror support substrates of the input/output micro-mirrors, and the second fiber support substrates of the input/output optical fiber bundles, and the vertical part of the groove at an inside of the groove

Serial No. 10/066,764

Docket No. K-0392

Reply dated February 11, 2004

In Response to Office Action dated October 17, 2003

facilitates vertical insertion, and fixation of the third-micro-mirror support substrates of the input/output micro-mirrors and the second-fiber support substrates of the input/output optical fiber bundles are required to be inserted in the first substrate. Thus, since initial upper and lower sides, and left and right sides alignments between the third-micro-mirror support substrates of the input/output micro-mirrors and the second-fiber support substrates of the input/output optical fiber bundles are very important, precise control of widths, lengths, and depths of the grooves is very important.

*Please replace paragraph [023] on page 7 with the following amended paragraph:*

Then, the third-micro-mirror support substrates of the input/output micro-mirrors, and the second-fiber support substrates of the input/output optical fiber bundles inserted in respective grooves in the first substrate are fixed by epoxy, eventually fixing the third-micro-mirror support substrates of the input/output micro-mirrors, and the second-fiber support substrates of the input/output optical fiber bundles, not in a free space, but to the first substrate, thereby permitting, not an active optical alignment, but an optical high precision self-alignment.

*Please replace paragraph [026] on page 8 with the following amended paragraph:*

As a total optical path from an input terminal to an output terminal is in a range of a distance between the two micro mirrors, not greater than 1/4 of the same in the related art, a total light loss can be reduced. Moreover, if the input/output optical fiber bundles are fitted to respective second-filbert support substrates, but one second-fiber support substrate, a fabrication process becomes much simpler.

Serial No. 10/066,764

Docket No. K-0392

Reply dated **February 11, 2004**

In Response to Office Action dated October 17, 2003

*Please replace paragraph [028] on page 8 with the following amended paragraph:*

Referring to FIG. 7, the OXC optical switch in accordance with a second preferred embodiment of the present invention includes an input optical fiber bundle, and an output optical fiber bundle fitted in parallel to one second-fiber support substrate which is in turn fixed in a groove in a first substrate, and, alike the first embodiment of the present invention, input/output micro mirrors fitted to third micro-mirror support substrates at a 45° to an optical path from the input optical fiber bundle, which is in turn fixed to grooves in the first substrate.

*Please replace paragraph [029] on page 8 with the following amended paragraph:*

In the second embodiment of the present invention, since the input/output optical fiber bundles are integrated to one fiber support substrate, the optical alignment is simpler and easier than the first embodiment of the present invention in which the input optical fiber bundle, and the output optical fiber bundle are separate.